HITACHI

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FOR MESSRS. ____________________ DATE. Apr.23.‘01

CUSTOMER’S ACCEPTANCE SPECIFICATIONS

SP14Q002-C2A

CONTENTS

* WHEN PRODUCT WILL BE DISCONTINUED , CUSTOMER WILL BE INFORMED BY HITACHI WITH TWELVE MONTHS PRIOR ANNOUNCEMENT.

ACCEPTED BY; ____________________ PROPOSED BY; H.T. Chen

RECORD OF REVISION

DATE	SHEET No.	SUMMARY
Apr.23.'01	7B64PS2703- SP14Q002-C2A-2 PAGE 3-1/1	CHANGED : TRANSPARENCY 78% min → 76% min
	7B64PS2705- SP14Q002-C2A-2 PAGE 6-2/2	CHANGED : BRIGHTNESS TYP. 140 cd/㎡ → 110 cd/㎡
	7B63PS2709- SP14Q002-C2A-2 PAGE 9-1/2	CHANGED : DETAIL A FFC CONDUCTIVE AND STIFFENER LENGTH..
	7B64PS2709- SP14Q002-C2A-2 PAGE 9-2/2	ADDED : TOUCH PANEL INTERFACE PIN CONNECTION.
	7B64PS2714- SP14Q002-C2A-2 PAGE 14-1/3~3/3	ADDED : 14 DIGITIZER TECHNICAL SPECIFICATION.

3. GENERAL SPECIFICATIONS

(1)	PART NAME	SP14Q002-C2A
(2)	OUTER DIMENSIONS	167.0(W)mm×109.0(H)mm×11.4(D)mm(max.)
(3)	EFFECTIVE DISPLAY AREA	120 mm min. × 89 mm min
(4)	DOT SIZE	0.345(W)min. × 0.345(H)min
(5)	DOT PITCH	0.360(W)mm × 0.360(H)mm
(6)	DOT NUMBER (RESOLUTION)	320 (W) × 240 (H)
(7)	DUTY RATIO	1/240
(8)	LCD TYPE	TRANSMISSIVE TYPE F-STN WITH GLARE TYPE UPPER POLARIZER
(9)	VIEWING DIRECTION	6 O'CLOCK
(10)	BACK LIGHT TYPE	COLD CATHODE FLUORESCENT LAMP.
(11)	TOUCH PANEL	ANALOG RESISTANCE 4wires TRANSPARENCY：76% min SURFACE TYPE：ANTI GLARE

4. ABSOLUTE MAXIMUM RATINGS

4.1 ELECTRICAL ABSOLUTE MAXIMUM RATINGS. VSS=0V:STANDARD

ITEM	SYMBOL	MIN.	MAX.	UNIT	COMMENT
POWER SUPPLY FOR LOGIC	VDD-VSS	0	7.0	V	
POWER SUPPLY FOR LC DRIVE	VDD-VEE	0	30	V	
INPUT VOLTAGE	Vi	-0.3	VDD+0.3	V	NOTE 1
INPUT CURRENT	Ii	0	1	A	
STATIC ELECTRICITY	VESD0	-	+/-100	V	NOTE 2,3,4
	VESD1	-	+/-10	KV	NOTE 2,3,5

NOTE (1) : $\overline{\text{DISP.OFF}}$, FRAME , LOAD , CP , D0~D3.
NOTE (2) : MAKE CERTAIN YOU ARE GROUNDED WHEN HANDLING LCM.
NOTE (3) : ENEGY STORAGE CAPACITANCE 200PF , DISCHARGE RESISTANCE 250Ω Ta=25℃ , 60%RH.
NOTE (4) : CONTACT DISCHARGE TO I/F CONNECTOR PINS.
NOTE (5) : CONTACT DISCHARGE TO FRONT METAL BEZEL.

4.2 ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS.

ITEM	OPERATING		STORAGE		OMMNT
	MIN.	MAX.	MIN.	MAX.	
AMBIENT TEMPERATURE	0°C	60°C	-20°C	70°C	NOTE 2,3
HUMIDITY	NOTE 1		NOTE 1		WITHOUT CONDENSATION
VIBRATION	-	2.45m/s^2 (0.25G)	-	11.76m/s^2 (1.2G) NOTE 5	NOTE 4 1 HOUR MAX.
SHOCK	-	29.4m/s^2 (3 G)	-	490.0m/s^2 (50 G) NOTE 5	XYZ DIRECTIONS
CORROSIVE GAS	NOT ACCEPTABLE		NOT ACCEPTABLE		

NOTE (1) Ta<=40°C : 85%RH max.
Ta>40°C : ABSOLUTE HUMIDITY MUST BE LOWER. THAN THE HUMIDITY OF 85%RH AT 40°C
NOTE (2) Ta AT -20°C ----< 48HRS, AT 60°C < 168HRS.
NOTE (3) BACKGROUND COLOR CHANGES SLIGHTLY DEPENDING ON AMBIENT TEMPERATURE. THIS PHENOMENON IS REVERSIBLE.
NOTE (4) 5Hz~100Hz (EXCEPT RESONANCE FREQUENCY)
NOTE (5) THIS MODULE SHOULD BE OPERATED NORMALLY AFTER FINISH THE TEST.
NOTE (6) WHEN LCM WILL BE OPERATED AT 0°C , THE LIFE TIME OF CFL WILL BE REDUCED. NEED TO MAKE SURE OF VALUE OF THE CHARACTERISTICS OF INVERTER. ALSO THE RESPONSE TIME AT 0°C WILL BE SLOWER.
NOTE (7) THERE ARE POSSIBILITY THAT COLOR UN-UNIFORMITY HAPPENED WHILE OPERATING AT OVER 40°C.

5. ELECTRICAL CHARACTERISTICS

5.1 ELECTRICAL CHARACTERISTICS

I T E M	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
POWER SUPPLY VOLTAGE FOR LOGIC	VDD-VSS	-	5.0-5%	5.0	5.0+5%	V
			3.3-5%	3.3	3.3+5%	
POWER SUPPLY VOLTAGE FOR LC DRIVING	VEE-VSS	-	-23.1	-22.0	-20.9	V
INPUT VOLTAGE NOTE 1	VI	H LEVEL	0.8VDD	-	VDD	V
		L LEVEL	0	-	0.2VDD	V
POWER SUPPLY CURRENT FOR LOGIC NOTE 4	IDD	VDD-VSS=5.0V VEE-VSS= -22.0V	-	6.0	-	mA
POWER SUPPLY VOLTAGE FOR LC DRIVING NOTE 4	IEE	VDD-VSS=5.0V VEE-VSS= -22.0V	-	5.0	-	mA
RECOMMENDED LC DRIVING VOLTAGE NOTE 3	VDD-V0	Ta= 0°C , ϕ= 0°	-	22.0	-	V
		Ta=25°C , ϕ= 0°	-	21.0	-	V
		Ta=50°C , ϕ= 0°	-	19.0	-	V
FRAME FREQUENCY	fFRAME	-	70	75	80	Hz

NOTE 1 $\overline{\text{DISP.OFF}}$, FRAME , LOAD , CP , D0~D3.

NOTE 2 RECOMMENDED LC DRIVING VOLTAGE MAY FLUCTUATE ABOUT +/-1.0V BY EACH MODULE.

NOTE 3 NEED TO MAKE SURE OF FLICKERING AND RIPPLING OF DISPLAY WHEN SETTING THE FRAME FREQUENCY IN YOU SET.
TEST PATTERN IS ALL “Q”

NOTE 4 fFRAME=75Hz ,TEST PATTERN IS ALL “Q”.
VDD-V0=21.0V , Ta=25°C

5.2 ELECTRICAL CHARACTERISTICS OF BACKLIGHT

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTE
LAMP VOLTAGE	VL	-	(300)	-	Vrms	Ta=25°C
FREQUENCY	fL	-	70	85	kHz	Ta=25°C
LAMP CURRENT	IL	4	5	6	mArms	Ta=25°C
STARTING DISCHARGE VOLTAGE	VS NOTE 2	(1000)	-	-	Vrms	Ta=25°C

PLEASE CERTAINLY INFORM HITACHI BEFORE DESIGNING LAMP DRIVE CIRCUIT ACCORDING TO THE ABOVE SPECIFICATIONS.

NOTE 1 PLEASE MAKE SURE THAT YOUR INVERTER IS DESIGNED TO MEET THE ABOVE SPECIFICATIONS.

NOTE 2 STARTING DISCHARGE VOLTAGE IS INCREASED WHEN LCM IS OPERATING AT LOWER TEMPERATURE
PLEASE CHECK THE CHARACTERISTICS OF YOUR INVERTER BEFORE APPLING TO YOUR SET.

NOTE 3 AVERAGE LIFE TIME OF CFL WILL BE DECREASED WHEN LCM IS OPERATING AT LOWER TEMPERATURE.

NOTE 4 UNDER LOWER DRIVING FREQUENCY OF AN INVERTER , A CERTAIN BACKLIGHT SYSTEM (CFL & CFL REFLECTION SHEET) MAY GENERATE A SOUND NOISE.

NOTE 5 WHEN ICFL IS USED OVER 5.5mA , IT MAY CAUSE UNEVEN CONTRAST NEAR CFL LOCATION , DUE TO HEAT DISPERSION FROM CFL.

6. OPTICAL CHARACTERISTICS

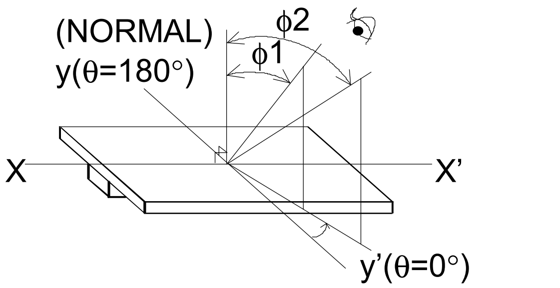
6.1 OPTICAL CHARACTERISTICS

Ta=25°C(BACKLIGHT ON)

ITEM	SYMBOL	CONDITIONAL	MIN.	TYP.	MAX.	UNIT	NOTE
VIEWING AREA	$\phi 2-\phi 1$	K>=2.0	-	40	-	deg	1,2
CONTRAST RATIO	K	$\phi=0°, \theta=0°$	-	25	-	-	3
RESPONSE TIME (RISE)	tr	$\phi=0°, \theta=0°$	-	120	-	ms	4
RESPONSE TIME (FALL)	tf	$\phi=0°, \theta=0°$	-	150	-	ms	4

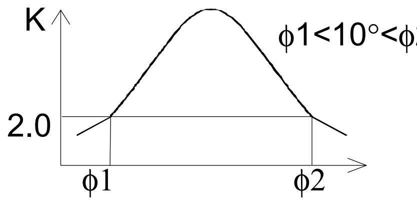
(MEASURE CONDITION BY HITACHI)

NOTE 1. DEFINITION OF θ AND ϕ



VIEWING DIRECTION

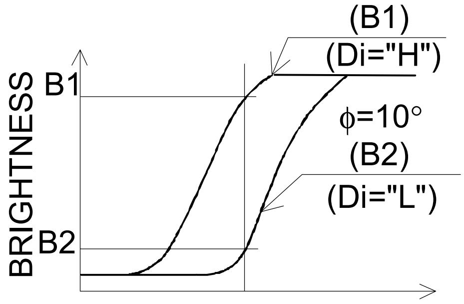
NOTE 2. DEFINITION OF VIEWING ANGLE $\phi 1$ AND $\phi 2$.

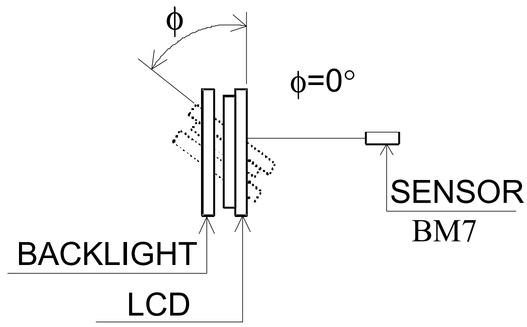


CONTRAST RATIO K VS VIEWING ANGLE ϕ

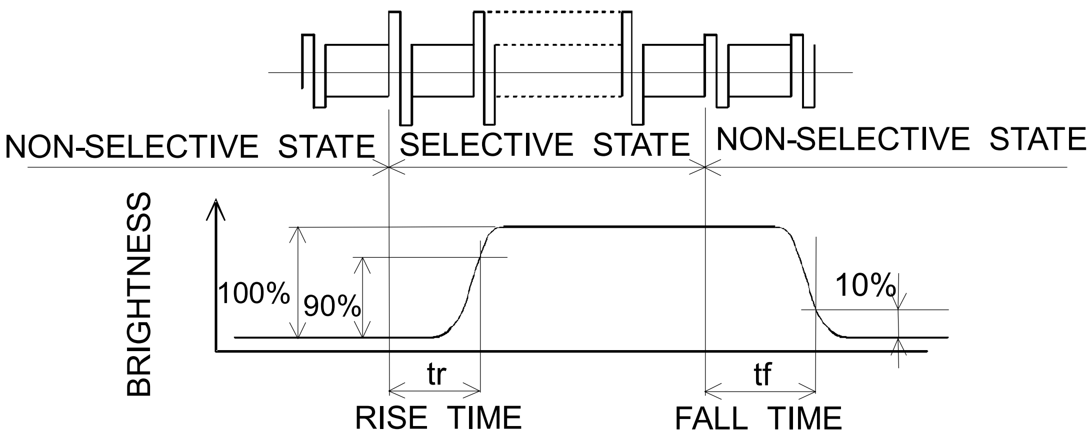
NOTE 3. DEFINITION OF CONTRAST "K"

$$K = \frac{\text{BRIGHTNESS ON SELECTED DOT (B1)}}{\text{BRIGHTNESS ON NON-SELECTED DOT (B2)}}$$





NOTE 4. DEFINITION OF OPTICAL RESPONSE



6.2 OPTICAL CHARACTERISTICS OF BACKLIGHT

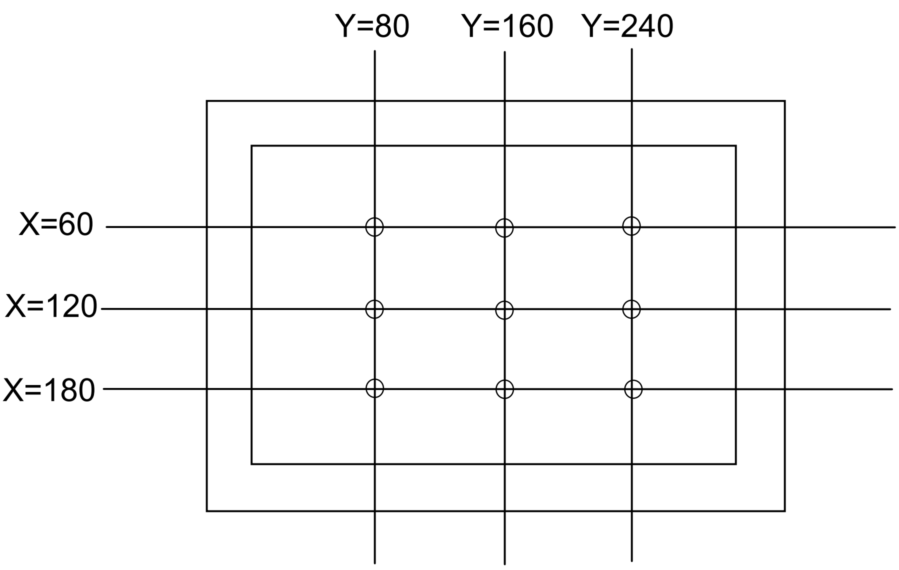
I T E M	MIN.	TYP.	MAX.	UNIT	NOTE
BRIGHTNESS	-	110	-	cd/m^2	IL=5mA NOTE 1,2
RISE TIME	-	5	-	MINUTE	IL=5mA BRIGHTNESS 80%
BRIGHTNESS UNIFORMITY	-	-	+/-30	%	UNDERMENTIONED NOTE 1,3

CFL : INITIAL, Ta=25°C, VDD-V0=21.0V
DISPLAY DATA SHOULD BE ALL “ON”.

NOTE 1. MEASUREMENT AFTER 10 MINUTES OF CFL OPERATING.

NOTE 2. BRIGHTNESS CONTROL : 100%

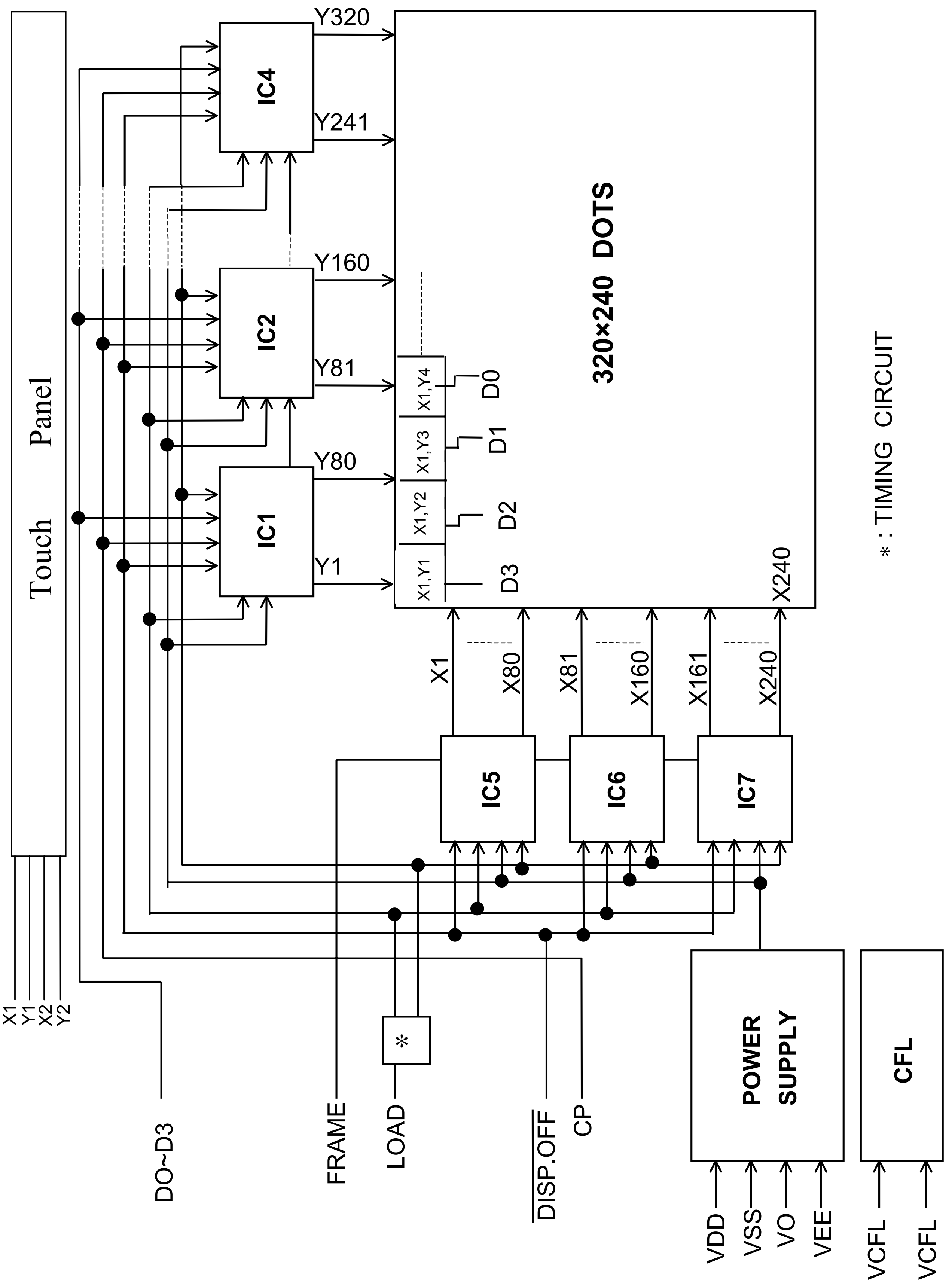
NOTE 3.MEASURE OF THE FOLLOWING 9 PLACES ON THE DISPLAY.



DEFINITION OF THE BRIGHTNESS TOLERANCE.

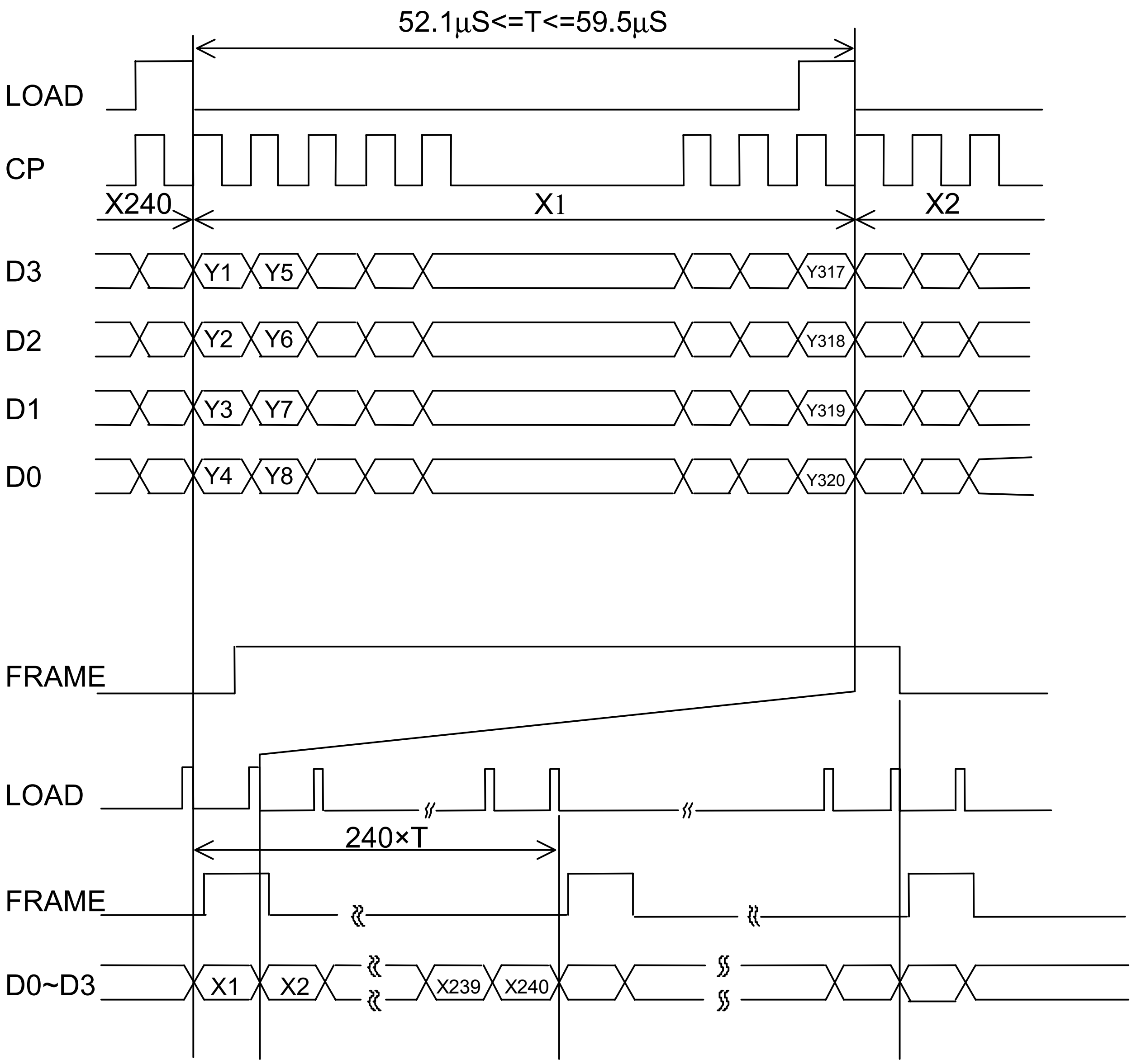
$$\left(\frac{\text{MAX OR MIN BRIGHTNESS - AVERAGE BRIGHTNESS}}{\text{AVERAGE BRIGHTNESS}} \right) \times 100\%$$

7. BLOCK DIAGRAM



8. INTERFACE TIMING CHART

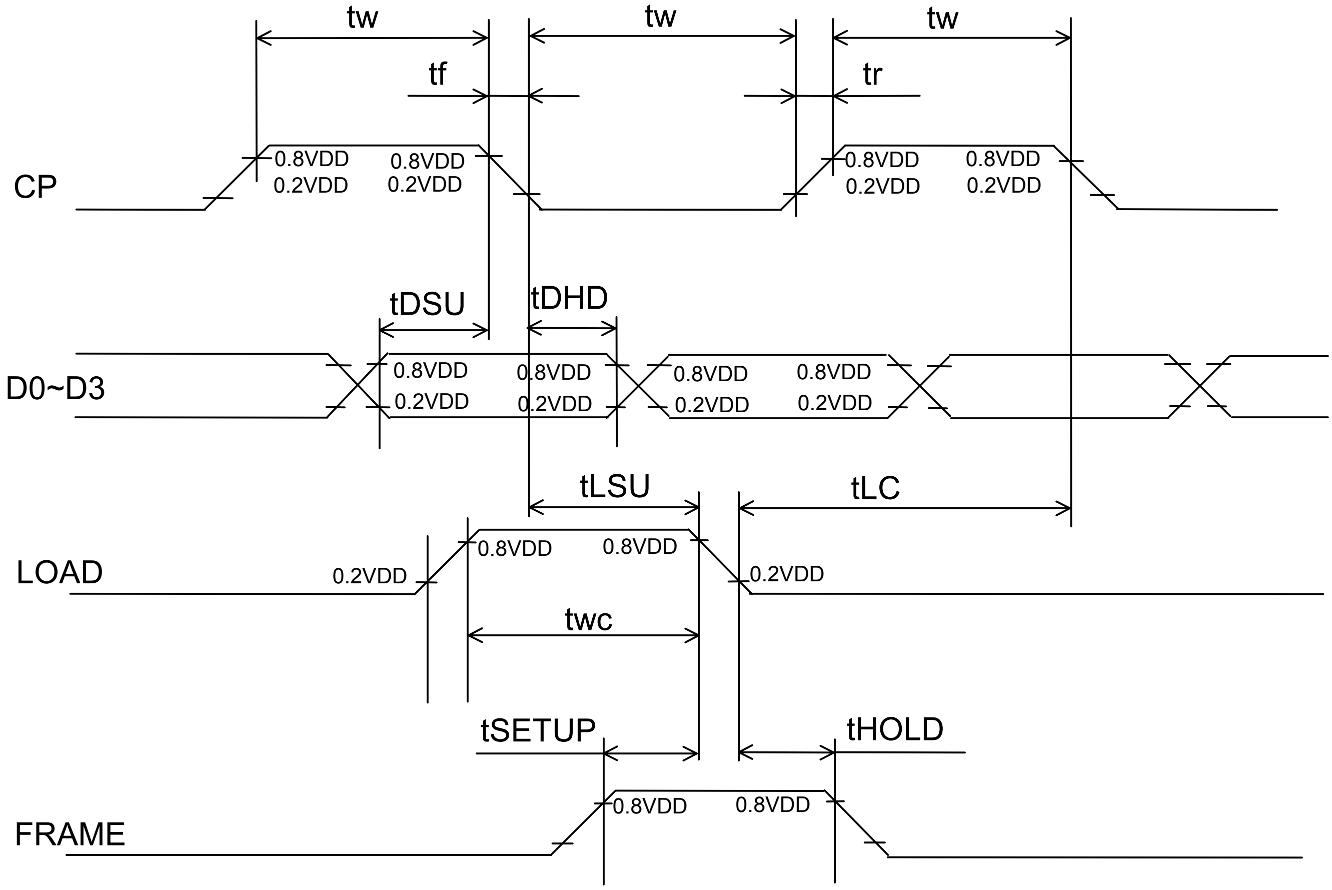
8.1 INTERFACE TIMING CHART



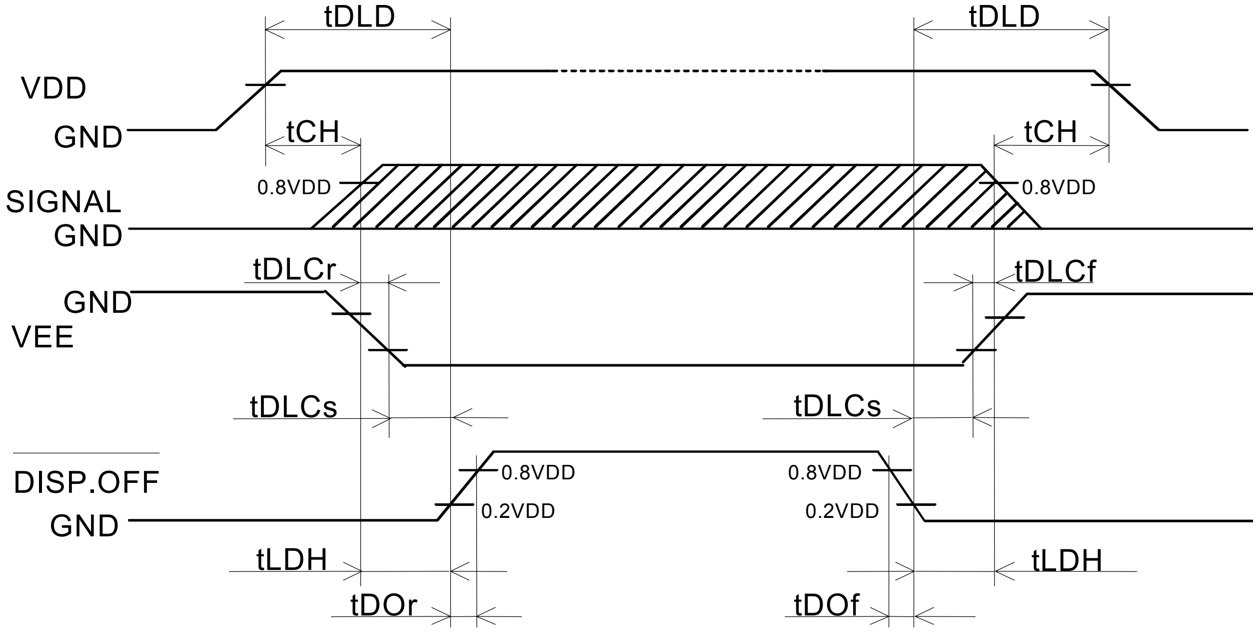
8.2 TIMING CHARACTERISTICS

0°C<=Ta=50°C,VDD=5.0V+/-5%

ITEM	SYMBOL	MIN.	TYP.	MAX.	UMIT
CLOCK FREQUENCY	fCP	-	-	6.5	MHz
CLOCK PULSE WIDTH	tW	45	-	-	ns
CLOCK RISE, FALL TIME	tr,tf	-	-	15	ns
DATA SET UP TIME	tDSU	30	-	-	ns
DATA HOLD TIME	tDHD	30	-	-	ns
LOAD SET UP TIME	tLSU	80	-	-	ns
LOAD CLOCK TIME	tLC	120	-	-	ns
"FRAME" SET UP TIME	tSETUP	100	-	-	ns
"FRAME" HOLD TIME	tHOLD	100	-	-	ns
"LOAD" PULSE WIDTH	tWC	125	-	-	ns



8.3 POWER ON/OFF TIMING SEQUENCE

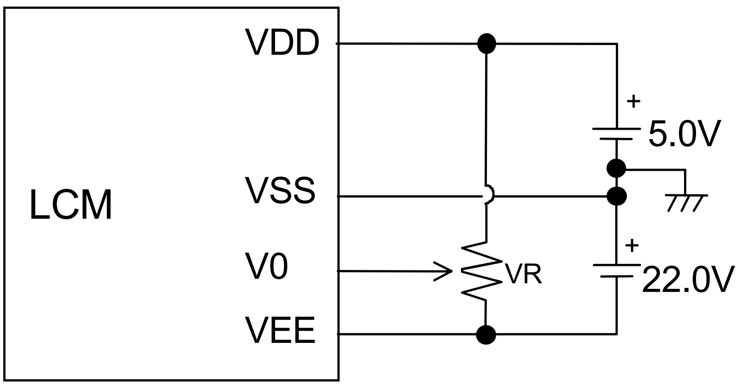


SYMBOL	MIN	MAX	UNIT	COMMENT
tDLD	200	-	ms	(NOTE 1)
tCH	0	200	ms	
tLDH	0	-	ms	
tDOr	-	100	ns	(NOTE 2)
tDOf	-	100	ns	
tDLCr	0	-	ms	
tDLCf	0	-	ms	
tDLCs	20	-	ms	

NOTE 1 PLEASE KEEP THE SPECIFIED SEQUENCE BECAUSE WRONG SEQUENCE MAY CAUSE PERMANENT DAMAGE TO THE LCD PANEL.

NOTE 2 HITACHI RECOMMENDS YOU TO USE DISP.OFF FUNCTION. DISPLAY QUALITY MAY DETERIORATE IF YOU DON'T USE DISP.OFF FUNCTION.

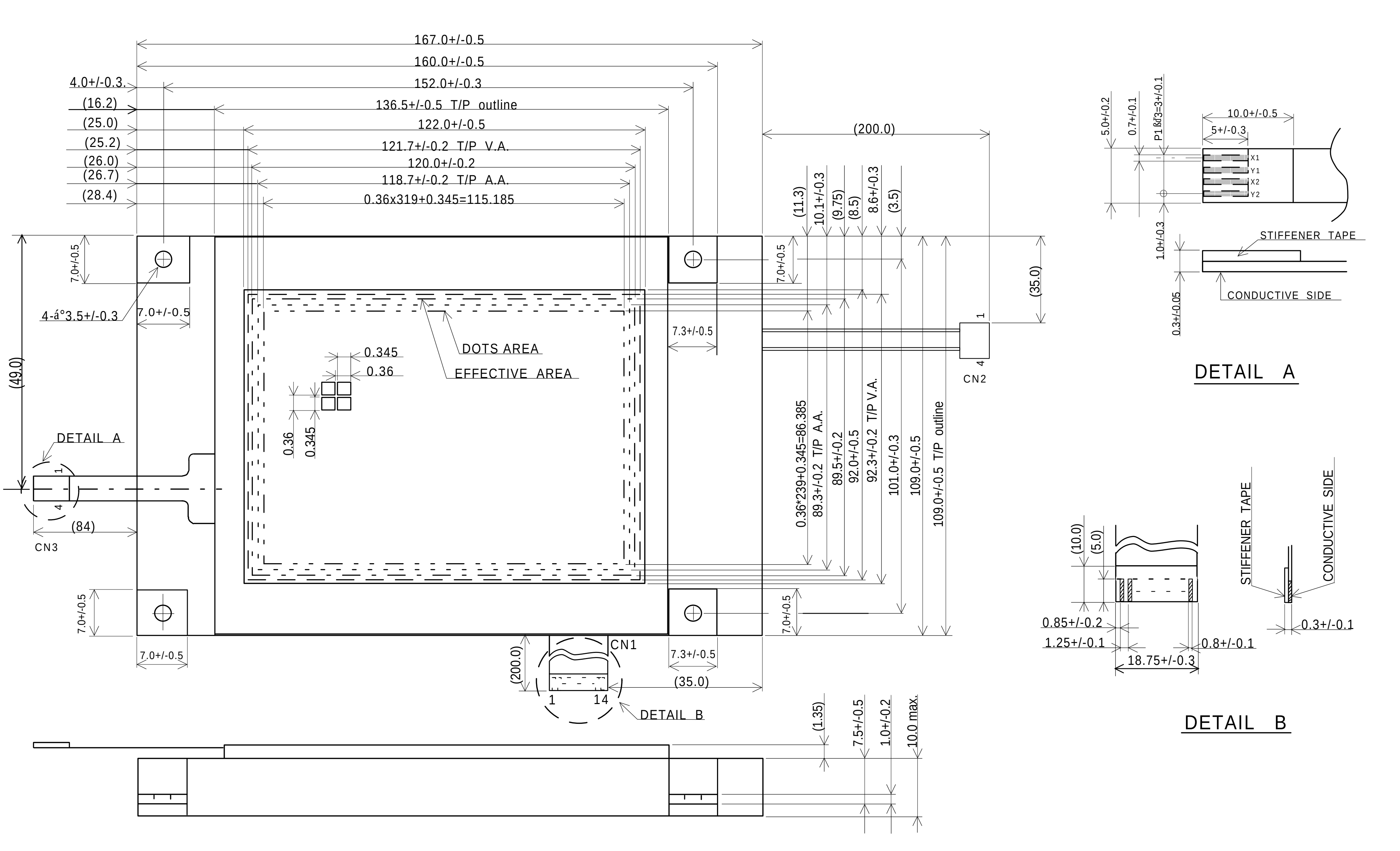
8.4 POWER SUPPLY FOR LCM (EXAMPLE)



NOTE (1) : VR : 10kΩ

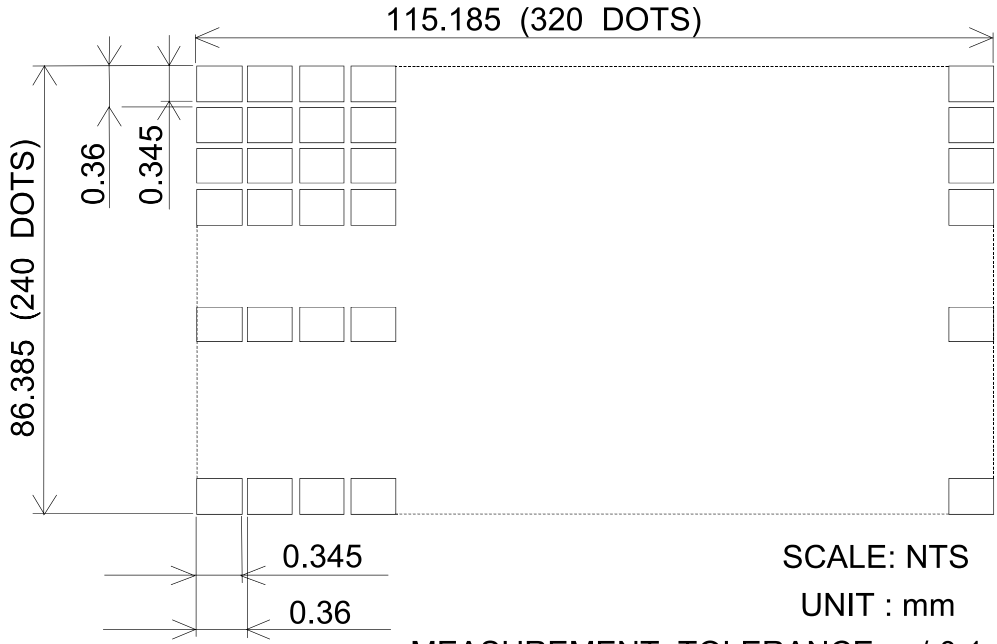
9.DIMENSIONAL OUTLINE

9.1DIMENSIONAL OUTLINE



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9.2 DISPLAY PATTERN



SCALE: NTS
UNIT : mm
MEASUREMENT TOLERANCE : +/-0.1

9.3 INTERFACE PIN CONNECTION

FFC：PITCH 1.25mm 14 PINS

INTERFACE		PIN No.	SIGNAL	LEVEL	FUNCTION
LCM	CN1	1	D0	H/L	DISPLAY DATA
		2	D1		
		3	D2		
		4	D3		
		5	$\overline{\text{DISP.OFF}}$	H/L	H : ON / L : OFF
		6	FRAME	H	FIRST LINE MARKER
		7	N.C	-	-
		8	LOAD	H→L	DATA LATCH
		9	CP	H→L	DATA SHIFT
		10	VDD	-	POWER SUPPLY FOR LOGIC
		11	VSS	-	GND
		12	VEE	-	POWER SUPPLY FOR LC
		13	V0	-	OPERATING VOLTAGE LC DRIVING
		14	VSS	-	GND

RECOMMEND SUITABLE CONNECTOR : (MOLEX) 5597-14APB

INTERFACE		PIN No.	SIGNAL	LEVEL	FUNCTION
CFL	CN2	1	VCFL	-	POWER SUPPLY FOR CFL
		2	N.C	-	-
		3	N.C	-	-
		4	VCFL	-	CFL GND

CFL I/F : J.A.E./ IL – G – 4S –S3C2

FPC : PITCH 1.0mm 4PINS

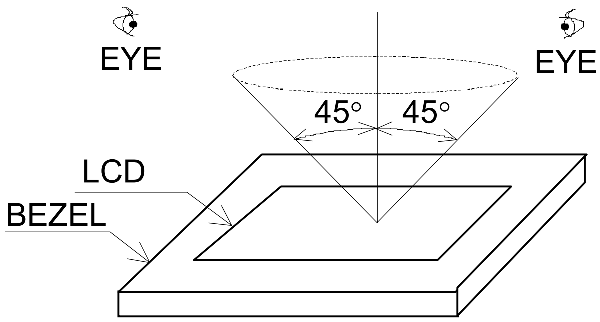
INTERFACE		PIN No.	SIGNAL	FUNCTION
T/P	CN3	1	X1	ANALOG SIGNAL FROM DIGITIZER RIGHT
		2	Y1	ANALOG SIGNAL FROM DIGITIZER UP
		3	X2	ANALOG SIGNAL FROM DIGITIZER LFET
		4	Y2	ANALOG SIGNAL FROM DIGITIZER BOTTOM

RECOMMEND SUITABLE CONNECTOR : (HIROSE) FH12-10(4)SA-ISH

10. APPEARANCE STANDARD

10.1 APPEARANCE INSPECTION CONDITIONS (IN THE EFFECTIVE VIEWING AREA) VISUAL INSPECTION SHOULD BE UNDER THE FOLLOWING CONDITION.

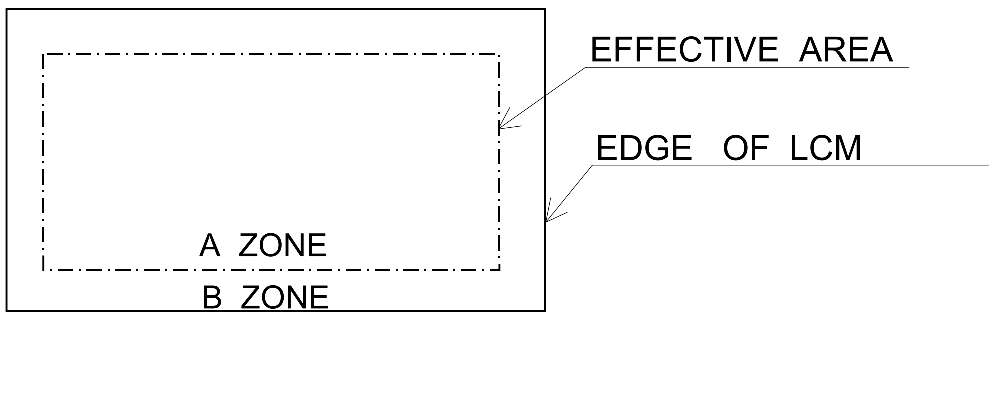
(1) IN THE DARK ROOM.
(2) WITH CFL PANEL LIGHTED WITH PRESCRIBED INVERTER CIRCUIT.
(3) WITH EYE TO LCD DISTANCE IS 25CM.
(4) VIEWING ANGLE WITHIN 45 DEGREES FROM THE PERPENDICULAR TO THE CENTER LCD.



10.2 DEFINITION OF EACH ZONE

A ZONE : WITHIN THE VIEWING AREA SPECIFIED AT PAGE 9-1/2 OF THIS DOCUMENT.

B ZONE : AREA BETWEEN THE EDGE LINE OF LCD GLASS AND THE VIEWING AREALINE SPECIFIED AT PAGE 9-1/2 OF THIS DOCUMENT.



10.3 APPEARENCE SPECIFICATION

*) IF A PROBLEM OCCURS IN RESPECT TO ANY OF THESE ITEMS, RESPONSIBLES OF BOTH PARTIES (CUSTOMER AND HITACHI) WILL DISCUSS IN MORE DETAIL.

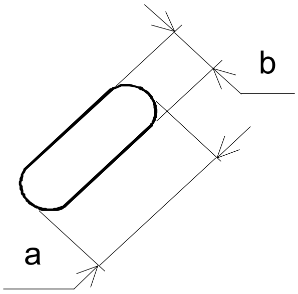
No.	ITEM	CRITERIA				A	B
LCD	SCRATCHES	DISTINGUISHED ONE IS NOT ACCEPTABLE (TO BE JUDGED BY HITACHI LIMIT SAMPLE)				*	-
	DENT	SAME AS ABOVE				*	-
	WRINKLES IN POLARIZER	SAME AS ABOVE				*	-
	BUBBLES	AVERAGE DIAMETER D(mm)		MAXIMUM NUMBER ACCEPTABLE		O	-
		D<=0.2		IGNORE			
		0.2<D<=0.3		12			
		0.3<D<=0.5		3			
		0.5<D		NONE			
	STAINS, FOREIGN MATERIALS, DARK SPOT	FILAMENTOUS				O	-
		LENGTH L(mm)	WIDTH W(mm)	MAXIMUM NUMBER ACCEPTABLE			
		L<=2.0	W<=0.03	IGNORE			
		L<=3.0	0.03<W<=0.05	6			
		-	0.05<W	JUDGED BY "ROUND" SHAPE			
		ROUND				O	-
		AVERAGE DIA-METER D(mm)	MAXIMUM NUMBER ACCEPTABLE	MINIMUM SIZE			
		D<0.2	IGNORE	-			
		0.2 <=D<0.33	8	10mm			
		0.33<=D	NONE	-			
		TOTAL	FILAMENTOUS + ROUND = 10				
		THOSE WIPED OUT EASILY ARE ACCEPTABLE				O	O
	COLOR TONE	TO BE JUDGED BY HITACHI LIMIT SAMPLE				O	-
	COLOR UNIFORMITY	SAME AS ABOVE				O	-
	PINHOLE	AVERAGE DIAMETER D(mm)		MAXIMUM NUMBER ACCEPTABLE		O	-
		D<=0.15		IGNORE			
		0.15<D<=0.3		10			
		C<=0.015		IGNORE			
	CONTRAST IRREGULARITY (SPOT)	AVERAGE DIAMETER D(mm)	CONTRAST	MAXIMUM NUMBER ACCEPTABLE	MINIMUM SIZE		
		D<=0.25	TO BE JUDGED BY HITACHI	IGNORE	-		
		0.25<D<=0.35		10	20mm		
		0.35<D<=0.5		4	20mm		
		0.5 <D		NONE	-		

No.	ITEM	CRITERIA				A	B
LCD	CONTRAST IRREGULARITY (LINE) (FILAMENTOUS)	WIDTH D(mm)	LENGTH L(mm)	MAXIMUM NUMBER ACCEPTABLE	MINIMUM SIZE	O	-
		W<=0.25	L<=1.2	2	20mm		
		W<=0.2	L<=1.5	3	20mm		
		W<=0.15	L<=2.0	3	20mm		
		W<=0.1	L<=3.0	4	20mm		
		TOTAL		6			
	RUBBING SCRATCH	TO BE JUDGED BY HITACHI STANDARD				O	-

No.	ITEM	CRITERIA		
CFL B/L	DARK SPOTS, WHITE SPOTS FOREIGN MATERIALS (SPOT)	D<=0.4		IGNORE
		D>0.4		NONE
	FOREIGN MATERIALS (LINE)	W<=0.2	L<2.5	<=1
		W<=0.2	L>2.5	NONE
		W>0.2		NONE
	SCRATCHES	W<=0.1		IGNORE
		0.1<W<=0.2	L<=11.0	<=1
		0.1<W<=0.2	L>=11.0	NONE
		W<0.2		NONE

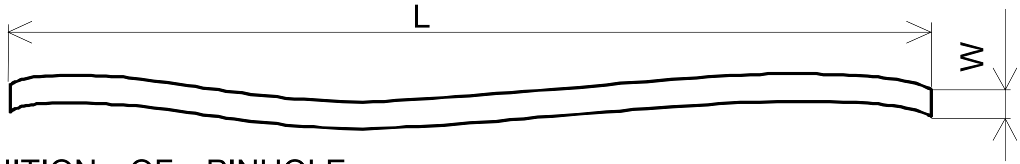
NOTE

(1) DEFINITION OF AVERAGE DIAMETER D

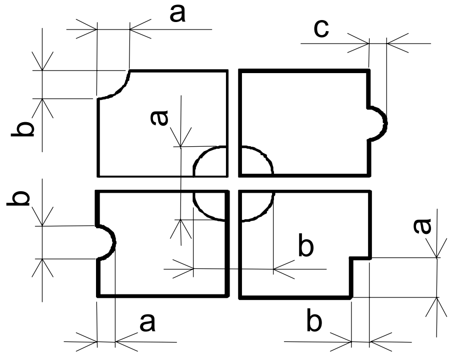


$$D = \frac{a+b}{2}$$

(2) DEFINITION OF LENGTH L AND WIDTH W



(3) DEFINITION OF PINHOLE



C : SALIENCE

11. PRECAUTION IN DESIGN

11.1 LC DRIVING VOLTAGE (VEE) AND VIEWING ANGLE RANGE.
SETTING VEE OUT OF THE RECOMMENDED CONDITION WILL BE A CAUSE FOR A CHANGE OF VIEWING ANGLE RANGE.

11.2 CAUTION AGAINST STATIC CHARGE
AS THIS MODULE IS PROVIDED WITH C-MOS LSI, THE CARE TO TAKE SUCH A PRECAUTION AS GROUNDING THE OPERATOR'S BODY IS REQUIRED WHEN HANDLING IT.

11.3 POWER ON SEQUENCE
INPUT SIGNALS SHOULD NOT BE APPLIED TO LCD MODULE BEFORE POWER SUPPLY VOLTAGE IS APPLIED AND REACHES TO SPECIFIED VOLTAGE (5V+/-0.5%).
IF ABOVE SEQUENCE IS NOT KEPT, C-MOS LSIS OF LCD MODULES MAY BE DAMAGED DUE TO LATCH UP PROBLEM.

11.4 PACKAGING
(1) NO. LEAVING PRODUCT IS PREFERABLE IN THE PLACE OF HIGH HUMIDITY FOR A LONG PERIOD OF TIME. FOR THEIR STORAGE IN THE PLACE WHERE TEMPERATURE IS 35 DEGREE C OR HIGHER, SPECIAL CARE TO PREVENT THEM FROM HIGH HUMIDITY IS REQUIRED. A COMBINATION OF HIGH TEMPERATURE AND HIGH HUMIDITY MAY CAUSE THEM POLARIZATION DEGRADATION AS WELL AS BUBBLE GENERATION AND POLARIZER PEEL-OFF. PLEASE KEEP THE TEMPERATURE AND HUMIDITY WITHIN THE SPECIFIED RANGE FOR USE AND STORAGE.

(2) SINCE UPPER/BOTTOM POLARIZERS TEND TO BE EASILY DAMAGED, THEY SHOULD BE HANDLED FULL WITH CARE SO AS NOT TO GET THEM TOUCHED, PUSHED OR RUBBED.

(3) AS THE ADHESIVES USED FOR ADHERING UPPER/BOTTOM POLERIZERS ARE MADE OF ORGANIC SUBSTANCES WHICH WILL BE DETERIORATED BY A CHEMICAL REACTION WITH SUCH CHEMICALS AS ACETONE, TULUENE, ETHANOLE AND ISOPROPYLALCOHOL. THE FOLLOWING SOLVENTS ARE RECOMMENDED FOR USE:
NORMAL HEXANE
PLEASE CONTACT US WHEN IT IS NECESSARY FOR YOU TO USE CHEMICALS.

(4) LIGHTLY WIPE TO CLEAN THE DIRTY SURFACE WITH ABSORBENT COTTON WASTE OR OTHER SOFT MATERIAL LIKE CHAMOIS , SOAKED IN THE CHAMICALS RECOMMENDED WITHOUT SCRUBBING IT HARDLY. TO PREVENT THE DISPLAY SURFACE FROM DAMAGE AND KEEP THE APPEARANCE IN GOOD STATE, IT IS SUFFICIENT, IN GENERAL, TO WIPE IT WITH ABSORBENT COTTON.

(5) IMMEDIATELY WIPE OFF SALIVA OR WATER DROP ATTACHED ON THE DISPLAY AREA BECAUSE ITS LONG PERIOD ADHERANCE MAY CAUSE DEFORMATION OR FADED COLOR ON THE SPOT.

(6) FOGY DEW DEPOSITED ON THE SURFACE AND CONTACT TERMINALS DUE TO COLDNESS WILL BE CAUSED FOR POLARIZER DAMAGE, STAIN AND DIRT ON PRODUCT. WHEN NECESSARY TO TAKE OUT THE PRODUCTS FORM SOME PLACE AT LOW TEMPERATURE FOR TEST, ETC. IT IS REQUIRED FOR THEM TO BE WARMED UP IN A CONTAINER ONCE AT THE TEMPERATURE HIGHER THAN THAT OF ROOM.

(7) TOUCHING THE DISPLAY AREA AND CONTACT TERMINALS WITH BARE HANDS AND CONTAMINATING THEM ARE PROHIBITED, BECAUSE THE STAIN ON THE DISPLAY AREA AND POOR INSULATION BETWEEN TERMINALS ARE OFTEN CAUSED BY BEING TOUCHED BY BARE HANDS. (THERE ARE SOME COSMETICS DETRIMENTAL TO POLARIZERS.)

(8) IN GENERAL THE QUALITY OF GLASS IS FRAGILE SO THAT IT TENDS TO BE CRACKED OR CHIPPED IN HANDLING, SPECIALLY ON ITS PERPHERY. BE CAREFUL NOT TO GIVE IT SHARP SHOCK CAUSED BY DROPPING DOWN, ETC.

11.5 CAUTION FOR OPAERATION

(1) IT IS AN INDISPENSABLE CONDITION TO DRIVE LCDS WITHIN THE SPECIFIED VOLTAGE LIMIT SINCE THE HIGHER VOLTAGE THAN THE LIMIT CAUSES THE SHORTER LCD LIFE. AN ELECTROCHEMICAL REACTION DUE TO DIRECT CURRENT CAUSES LCDS UNDESIRABLE DETERIORATION, SO THAT THE USE OF DIRECT CURRENT DRIVER SHOULD BE AVOIDED.

(2) RESPONSE TIME WILL BE EXTREMEL DELAYED AT LOWER TEMPERATURE THAN THE OPERATING TEMPERATURE RANGE AND ON THE OTHER HAND AT HIGHER TEMPERATURE LCDS SHOW DARK BULL COLOR IN THEM. HOWEVER THOSE PHENOMENA DO NOT MEAN MALFUNCTION OR OUT OF ORDER WITH LCDS WHICH WILL COME BACK IN THE SPECIFIED OPERATING TEMPERATURE RANGE.

(3) IF THE DISPLAY AREA IS PUSHED HARD DURING OPEARATION, SOME FONT WILL BE ABNORMALLY DISPLAYED BUT IT RESUMES NORMAL CONDITION AFTER TURNING OFF ONCE.

(4) A SLIGHT DEW DEPOSITING ON TERMINALS IS A CAUSE FOR ELECTOROCHEMICAL REACTION RESULTING IN TERMINAL OPEN CIRCUIT. USAGE UNDER THE RELATIVE CONDITION OF 40 DEGREE C 50%RH OR LESS IS REQUIRED.

11.6 STORAGE

IN CASE OF STORING FOR A LONG PERIOD OF TIME (FOR INSTANCE, FOR YEARS) FOR THE PURPOSE OF REPLACEMENT USE , THE FOLLOWING WAYS AREA RECOMMENDED.

(1) STORAGE IN A PLOYETHYLENE BAG WITH THE OPENING SEALED SO AS NOT TO ENTER FRESH AIR OUTSIDE IN IT , AND WITH NO DESICCANT.

(2) PLACING IN A DARK PLACE WHERE NEITHER EXPOSURE TO DIRECT SUNLIGHT NOR LIGHT IS , KEEPING TEMPERATURE IN THE RANGE FROM 0 DEGREE C TO 35 DEGREE C.

(3) STORAGE WITH NO TOUCH ON POLARIZER SURFACE BY ANYTHING ELSE. (IT IS RECOMMENDED TO STORE THEM AS THEY HAVE BEEN CONTAINED IN THE INNER CONTAINER AT THE TIME OF DELIVERY FROM US.)

11.7 SAFETY

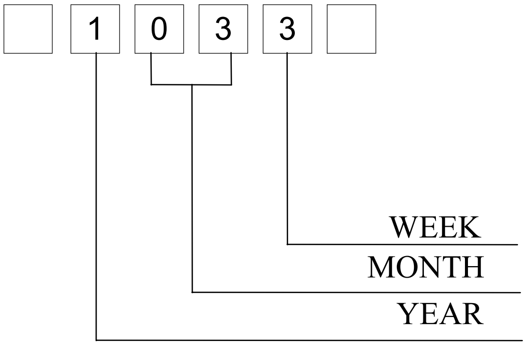
(1) IT IS RECOMMENDABLE TO CRASH DAMAGED OR UNNECESSARY LCDS INTO PIECES AND WASH OFF LIQUID CRYSTAL BY EITHER OF SOLVENTS SUCH AS ACETONE AND ETHANOL , WHICH SHOUD BE BURNED UP LATER.

(2) WHEN ANY LIQUID LEAKED OUT OF A DAMAGED GLASS CELL COMES IN CONTACT WITH YOUR HANDS , PLEASE WASH IT OFF WELL WITH SOAP AND WATER.

12. DESIGNATION OF LOT MARK

LOT MARK

LOT MARK IS CONSISTED OF 4 DIGHT NUMBER.



YEAR	FIGURE IN LOT MARK
2001	1
2002	2
2003	3
2004	4
2005	5

NOTE 1. SOME PRODUCTS HAVE ALPHABET AT THE END OR THE FIRST.

MONTH	FIGURE IN LOT MARK	MONTH	FIGURE IN LOT MARK
JAN.	01	JULY.	07
FEB.	02	AUG.	08
MAR.	03	SEPT.	09
APR.	04	OCT.	10
MAY.	05	NOV.	11
JUNE.	06	DEC.	12

WEEK (DAY IN CALENDAR	FIGURE IN LOT MARK
01~07	1
08~14	2
15~21	3
22~28	4
29~31	5

LOCATION OF LOT MARK : ON THE BACK SIDE OF LCM

1 0 3 3 T

T : MADE IN TAIWAN.

13. PRECAUTION FOR USE

13.1 A LIMIT SAMPLE SHOULD BE PROVIDED BY THE BOTH PARTIES ON AN OCCASION WHEN THE BOTH PARTIES AGREED ITS NECESSITY. JUDGEMENT BY A LIMIT SAMPLE SHALL TAKE EFFECT AFTER THE LIMIT SAMPLE HAS BEEN ESTABLISHED AND CONFIRMED BY THE BOTH PARTIES.

13.2 ON THE FOLLOWING OCCASIONS, THE HANDLING OF THE PROBLEM SHOULD BE DECIDED THROUGH DISCUSSION AND AGREEMENT BETWEEN RESPONSIBLE PERSONS OF THE BOTH PARTIES.

(1) WHEN A QUESTION IS ARISEN IN THE SPECIFICATIONS.

(2) WHEN A NEW PROBLEM IS ARISEN WHICH IS NOT SPECIFIED IN THIS SPECIFICATIONS.

(3) WHEN AN INSPECTION SPECIFICATIONS CHANGE OR OPERATING CONDITION CHANGE IN CUSTOMER IS REPORTED TO HITACHI, AND SOME PROBLEM IS ARISEN IN THIS SPECIFICATION DUE TO THE CHANGE.

(4) WHEN A NEW PROBLEM IS ARISEN AT THE CUSTOMER'S OPERAT-ING SET FOR SAMPLE EVALUATION IN THE CUSTOMER SITE.

THE PRECAUTION THAT SHOULD BE OBSERVED WHEN HANDLING LCM HAVE BEEN EXPLAINED ABOVE. IF ANY POINTS ARE UNCLEAR OR IF YOU HAVE ANY REQUEST , PLEASE CONTACT HITACHI.

14. DIGITIZER TECHNICAL SPECIFICATION

14.1 RATINGS

14.1.1 ABSOLUTE MAXIMUM RATINGS

ITEM	SPECIFICATION	COMMENT
OPERATING VOLTAGE	7V	WITHOUT CONDENSATION
CONTACT CURRENT	20mA	
OPERATING TEMPERATURE **	0~50°C 80%RH MAX	
STORAGE TEMPERATURE **	-20~70°C 90%RH MAX	

14.1.2 OPERATING CONDITIONS

ITEM	SPECIFICATION
OPERATING VOLTAGE	5VDC
CONTACT CURRENT	10 ~ 20 mA
ACTUATION FORCE	TBD

14.2 MECHANICAL STRENGTH

14.2.1 INPUT METHOD & ACTUATION FORCE

INPUT METHOD	ACTUATION FORCE	COMMENT
PEN	80g MAX	R0.8, POLYACETAL PEN
FINGER	100MAX	R8, SILICONE RUBBER

14.2.2 SURFACE HARDNESS

2H

14.3 OPTICAL CHARACTERISTICS

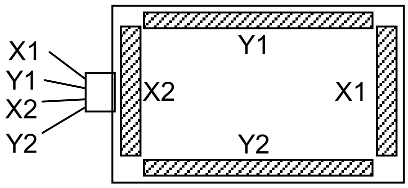
14.3.1 TRANSPARENCY : 76%.min

14.3.2 WAVE LENGTH : 450 ~ 700nm

14.4 ELECTRICAL CHARACTISTICS

14.4.1 CONDUCTIVE RESISTANCE

TERMINAL	CONDUCTIVE RESISTANCE
X1-X2	150~1300Ω
Y1-Y2	150~1300Ω



14.4.2 INSULATION RESISTINCE

TERMINAL	INSULATION RESISTANCE	TESTING VOLTAGE
X-Y	20MΩ	25VDC

14.4.3 BOUNCE CHATTERING

10msec max

14.4.4 CAPACITANCE

TBD

14.4.5 RESISTANCE FACTOR

TERMINAL	
X1-X2	10% max
Y1-Y2	10% max

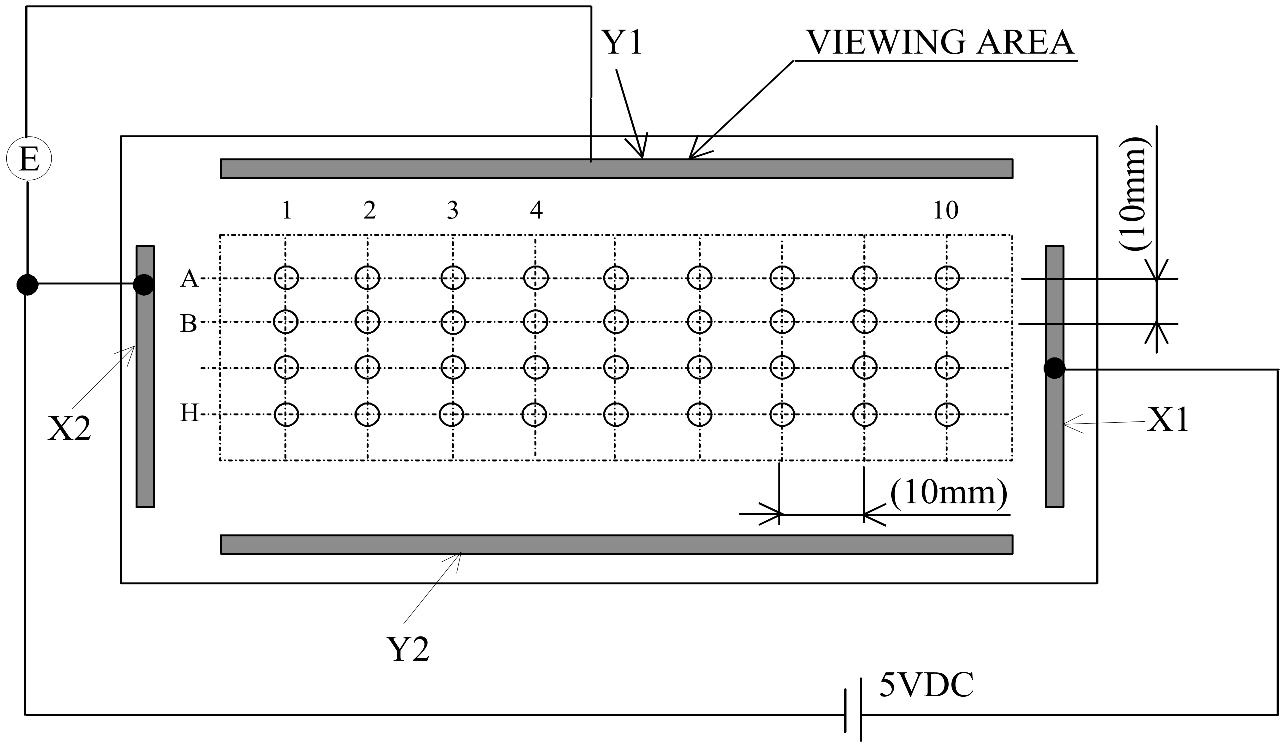
14.4.4 LINEARITY

(1) LINEARITY

LINEARITY DEVIATION : 2% max

(2) TESTING CIRCUIT

(a) Y AXIS LINEARITY TESTING METHOD , 100g ,VX1-VX2=5V , VOUT=VY1.

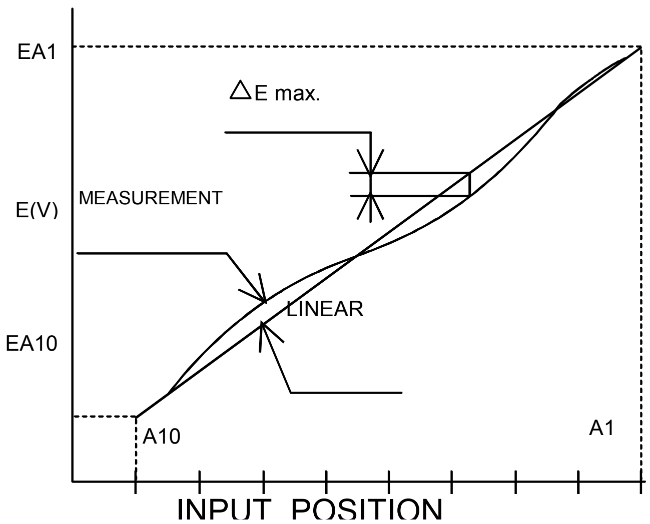


(b) X AXIS LINEARITY METHOD , VY1 –VY2=5V , VOUT=VX1

(3) CALCULATION

(a) Y AXIS LINEARITY

$$\text{LINEARITY}=\frac{\triangle \text{ E max.}}{\text{E A1} - \text{E A10}} * 100(\%)$$



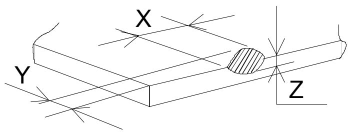
14.5 ENVIRONMENTAL TESTING

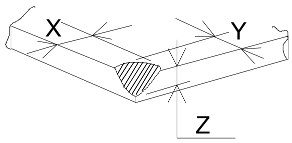
ITEM	CONDITIONS	CRITERIA
HIGH TEMPERATURE STORAGE	60°C : 120hrs & 25℃: 24hrs	AFTER TESTING MUST TO MEET THE SPECIFICATIONS OF THE ELECTRICAL, MECHANICAL & OPTICAL CHARACTERISTICS.
LOW TEMPERATURE STORAGE	-20°C : 120hrs & 25℃ : 24hrs	
TEMPERATURE CYCLE	-20°C ←→ 70°C : 10 CYCLES WITHIN (30) (60) (30) : MINUTES & 25℃ : 24hrs (WITHOUT CONDENSATION)	
HUMIDITY STORAGE	60°C , 90%RH. 120hrs	
DURABILITY FOR KEYSTROKE	150g , R8, HS40 SILICON RUBBER (SPEED : 330mm/SEC) : 1000000 ACTIVATIONS	

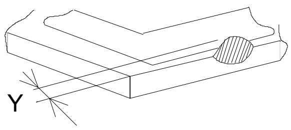
14.6 APPEARANCE SPECIFICATION

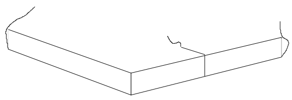
No.	ITEM	CRITERIA			A	B
T / P	Hair Flaws	FILAMENTOUS			O	-
		LENGTH L(mm)	WIDTH W(mm)	MAXIMUM NUMBER ACCEPTABLE		
		L<=12	W<=0.05	IGNORE		
		L<=5	0.05<W<=0.1	3		
		L>2	0.1 <W	NONE		
	DOT-SHAPED IMPURITIES	AVERAGE DIAMETER D(mm)	MAXIMUM NUMBER ACCEPTABLE		O	-
		D<=0.1	IGNORE			
		0.1<D<=0.3	5			
		0.3<D	NONE			
	SCRATCH	FILAMENTOUS			O	-
		LENGTH L(mm)	WIDTH W(mm)	MAXIMUM NUMBER ACCEPTABLE		
		L<=12	W<=0.05	IGNORE		
		L<=12	0.05<W<=0.1	5		
		L>12	0.1<W	NONE		

14.6.3 GLASS INDENTATION

<table>
<tr><th>ITEM</th><th>SPECIFICATIONS</th></tr>
<tr><td>COMMON
INDENTATION</td><td>

<table><tr><th>X</th><th>Y</th><th>Z</th></tr><tr><td><=5.0</td><td><=3.0</td><td><=t</td></tr></table>
BUT,INDENTATION CAN NOT INCLUDING SEAL AREA.
t:GLASS THUICKNESS.</td></tr>
<tr><td>CORNER
BROKEN</td><td>

<table><tr><th>X</th><th>Y</th><th>Z</th></tr><tr><td><=2.0</td><td><=5.0</td><td><=t</td></tr></table>
BUT,INDENTATION CAN NOT INCLUDING SEAL AREA.</td></tr>
<tr><td>INDENTATION WITNIN
PATTERN</td><td>

Y<=1 IS IGNORE.
BUT,MUST TO MEET THE SPECIFICATION OF CONDUCTING PATTERN INDENTATION.</td></tr>
<tr><td>PROCEEDING
CRACK</td><td>
NONE</td></tr>
</table>

14.6.4 BLISTERING (PUFFNES): 0.4mm max

